SC13152HP

Specification Amendments

At pages 1 and 18, please amend the title as follows:

METHOD OF FORMING LAND GRID ARRAY PACKAGED DEVICE ~~AND METHOD OF FORMING SAME~~

Please amend paragraphs **[0002]**, **[0022]**, **[0031]**, and **[0035]** of the specification as shown below.

[0002] An integrated circuit (IC) die is a small device formed ~~on~~ as part of a semiconductor wafer, such as a silicon wafer. A leadframe is a metal frame that usually includes a paddle that supports the IC die that has been cut from the wafer. The leadframe also has lead fingers that provide external electrical connections. That is, the die is attached to the die paddle and then bonding pads of the die are connected to the lead fingers via wire bonding or flip chip bumping to provide the external electrical connections. Encapsulating the die and wire bonds or flip chip bumps with a protective material forms a package. Depending on the package type, the external electrical connections may be used as-is, such as in a Thin Small Outline Package (TSOP), or further processed, such as by attaching spherical solder balls for a Ball Grid Array (BGA). These terminal points allow the die to be electrically connected with other circuits, such as on a printed circuit board. However, it can be expensive and time-consuming to form a leadframe and package a device if steps like chemical etching and etch back are required.

[0022] forming a plurality of soft conductive forms (e.g., balls) in a fixture, wherein opposing sides of the balls are at least partially flattened;

[0031] Referring now to FIGS. 2A-9, a method for packaging an IC die in accordance with the present invention will be described. FIGS. 2A and 2B show a fixture 30 for forming the soft conductive balls 14 in accordance with an embodiment of the present invention. FIG. 2A is a perspective view of the fixture 30 and FIG. 2B is an enlarged view of the conductive balls located in the fixture 30. An initial step in the process of packaging an integrated circuit die 12 is for ~~form~~ forming the soft balls 14. The fixture 30 is a block of metal having a large flat surface with a plurality of cavities in which the balls 14 are formed. The cavities are laid out in a grid or array on the surface of the fixture 30. Low manufacturing cost is one of the key considerations for the present invention. In the presently preferred embodiment, the balls 14 are formed by pouring molten metal on a spinning plate. This allows tiny metallic balls to be formed with very tight dimension control in a very cost effective way. The cavities in the fixture 30 are generally round. Preferably, the cavity has a flat or partially flattened bottom surface so that the portion of the ball formed within the cavity has a flattened or partially flattened surface. As an alternative to forming spherical balls or spherical balls with a flattened bottom surface, it is possible to use rectangular shaped ~~balls~~

forms. FIG. 10 shows an example of a rectangular ~~ball~~ form 15.

[0035] Other options for die attach exist. One option is to attach the dice 12 directly to the tape 36 at locations where there are no balls 14, as shown in FIG. 5B. That is, when forming the array of balls in the fixture 30, ~~leave~~ some spots are left without balls, such spots for receiving individual die 12. In this way, the die 12 has an exposed surface after encapsulation and de-taping. A second option is to attach the dice 12 to the tape 36 with a non-conductive epoxy 40, as shown in FIG. 5C. In a package formed using this second option, the die 12 is not exposed nor is there a conductive path between the die 12 and the outside of the finished package. This second option allows PCB routing under the package. Referring to FIG. 5D, yet another option is to attach the die 12 to a heat sink 42 (*e.g.*, a solid metal plate) with an epoxy or solder 44. The heat sink 42 can be attached to the tape 36 after the balls 14 are attached to the tape 36. The heat sink 42 can further improve the thermal performance of the package and increase the solderable area of the package.